GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Mathematics 3: Differential Equations (0000088)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Incheon	seminar
			lecture

Lecturers in academic year 2024-2025

Rao, Shodhan	KR01	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Science in Environmental Technology	5	A
Bachelor of Science in Food Technology	5	A
Bachelor of Science in Molecular Biotechnology	5	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	5	A

Teaching languages

English

Keywords

Ordinary and partial differential equations, Analytical methods, Numerical methods, Scilab, stability

Position of the course

This course will introduce students to basic and more advanced analytical and numerical methods for solving differential equations. They also learn to implement numerical computational methods using Scilab software.

Contents

1. Analytical methods: Ordinary differential equations: First, second and higher order, methods of undetermined coefficients and variation of parameters, second-order spring-mass-damper systems, Series solutions, Euler equation, Laplace transforms, Fourier series, method of separation of variables for parabolic partial differential equations.
2. Numerical methods: Direction fields, equilibrium points, stability and bifurcation, Euler's method and Runge-Kutta methods for first order differential equations, numerical integration.

Initial competences

0000095 - Mathematics 1: Engineering Mathematics;
0000083 - Mathematics 2: Multivariable Calculus and Geometry
0000096 - Informatics.

Final competences

1 Possess in-depth knowledge, insight and skills with regards to the foundation and applications of differential equations in engineering.
2 Identify the right technique to analytically solve a given real life problem involving simple linear differential equation.
3 Solve problems involving linear differential equations in certain areas of physics including mechanics, vibration and thermodynamics.
4 Implement and apply numerical methods for ordinary differential equations using Scilab software.
5 Perform correct and critical interpretations of the Scilab-output generated while

solving a differential equation.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture

Study material

Type: Slides

Name: Lecture slides
Indicative price: Free or paid by faculty
Optional: no
Language : English

Type: Other

Name: Lecture notes provided in the class
Indicative price: Free or paid by faculty
Optional: no
Language : English

References

W.E. Kohler, L.W. Johnson, "Elementary Differential Equations with Boundary Value Problems", 2nd Edition, Pearson, 2005
E. Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, Wiley, 2011.
W.E. Boyce, R.C. Prima, “Elementary Differential Equations”, 10th Edition, Wiley, 2012.

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Skills test, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Skills test, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Written assessment with open-ended questions

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Calculation of the examination mark

Nonperiodic Evaluation - Written examination with open questions: 20%
Periodic Evaluation (Final Exam) - Written exam with open questions, skills test: 80%
Students need to attend and participate in the exercise sessions in order to pass the course.